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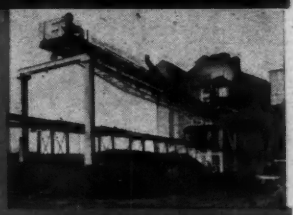

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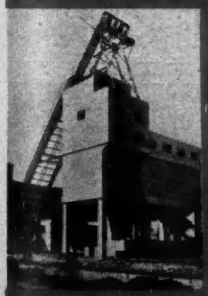

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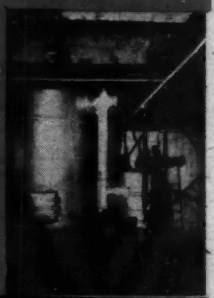

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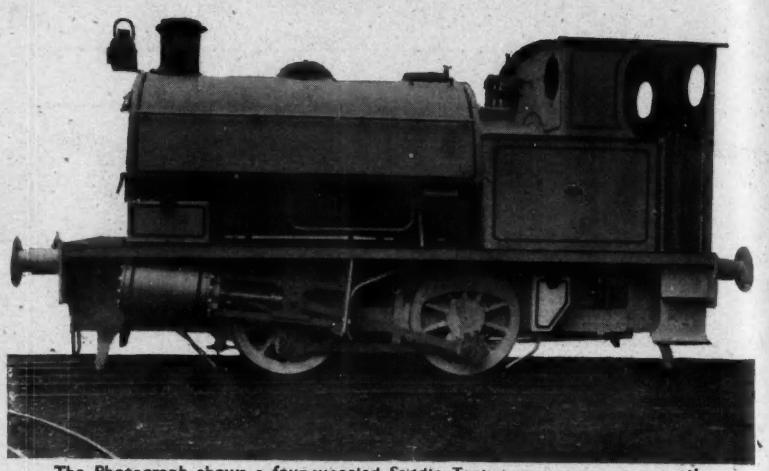

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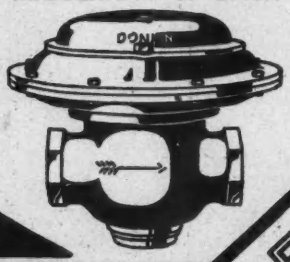

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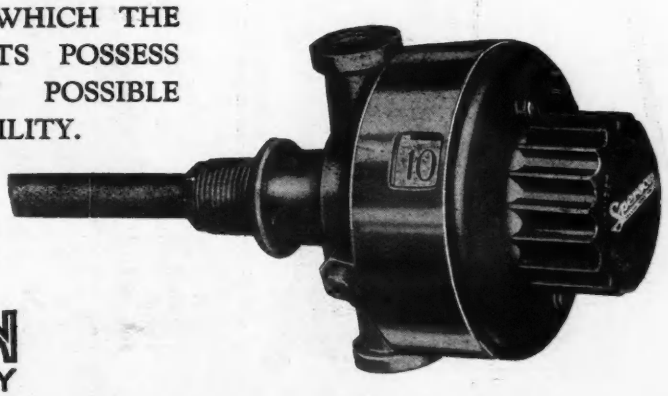

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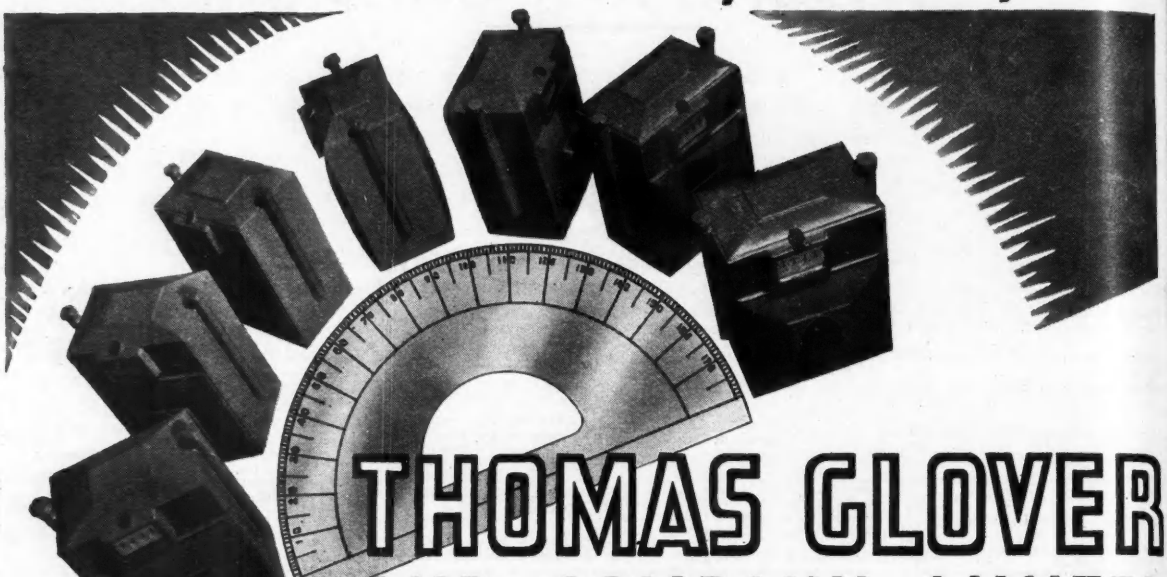

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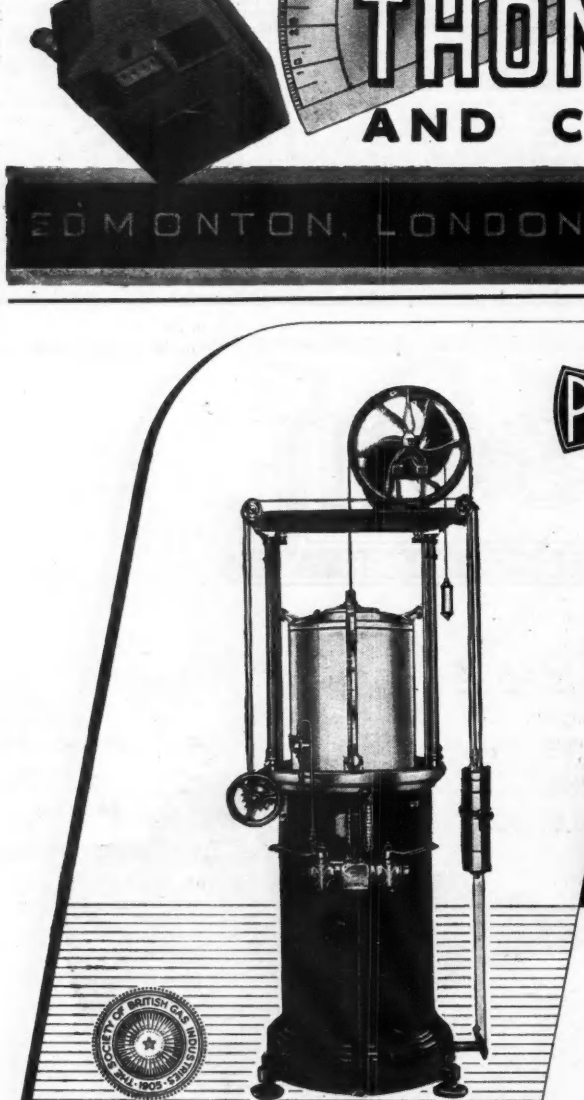

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GAS JOURNAL, JUNE 30, 1943

VOL. 241 95th YEAR No. 4180

EDITORIAL NOTES

RESEARCH ORGANIZATION

THE Chairman of the Gas Research Board, Mr. E. V. Evans, in his statement at the annual meeting of the Board (see last week's "JOURNAL," p. 772) made it clear that while the financial assistance from the Department of Scientific and Industrial Research is, of course, a welcome help, this has not been the sole reason for the Board's becoming officially associated with the Department. The Gas Industry also desired to obtain the enhanced status which this association brings in its train, and particularly did it wish to participate in the Standing Consultative Conference on fuel research which the Department is organizing. We have previously referred to this Co-ordinating Committee under the Chairmanship of Sir Harold Hartley, which seems to us an admirable practical means of giving agreed definition to the fields of work of all the State-aided fuel research associations, including electricity, refractories, coal, gas, and the Fuel Research Board itself. It is an excellent plan designed to avoid overlapping, foster co-operation, and channel effort in those directions likely to be most productive. We regard it as a most happy feature that the establishment of the Gas Research Board as a State-aided association, and the appointment of Dr. J. G. King as Director of the Board, should come at a time of unification, as it were, of the resources and work of the several associations dealing with research appertaining to fuel in its various forms. To the appointment of Dr. King we have also previously referred. The Gas Industry, we think, is very fortunate in the appointment in this capacity of one who has long and intimate knowledge of the art and practice of a Government research body. We are sure that this knowledge will prove invaluable, and we are equally sure that the Industry, eager to have its research work organized to the best advantage, will be keen to give full support to Dr. King's direction and suggestions.

We know that the Director of the Gas Research Board lacks neither ideas nor plans, and we know that he shares our view that the value of research work cannot be measured by the amount of money available for research ; what matters is that the money should be expended wisely, and that research should not be engaged upon for its own sake or for the glorification of a research department. For many years the Gas Industry has carried out quite a large amount of research and investigation, and it is estimated that during the years preceding the war gas undertakings and gas plant and appliance manufacturers were spending—we would emphasize that this is only an estimate —about £400,000 a year on research and development work. Whatever the amount, there is a great deal to be done in knitting this research more closely together, and in taking steps to see that it is applied in practice. This apart from new attacks on fresh subjects. Hence we like Dr. King's intention to set up within the Board an Intelligence Section adequately staffed—a section to collate and disseminate information relevant to the Industry's research; in other words an information bureau constantly in action for consultation. We can visualize the benefits to be derived if each fuel research association has similar arrangements for the purpose, and all contribute their specialized information to a Central Intelligence Bureau linking up the entire group, and enabling each constituent member to draw freely from the common fund of knowledge. Properly organized such a system should ensure, with freedom from overlapping, maximum result from minimum toil.

The aim of Dr. King (he has himself made this clear to us) is to tackle only research problems on the laboratory and intermediate scale in the Board's own laboratory—which means that the Board should have a laboratory. The setting-up of semi-scale or full-scale plant for the purpose of investigation is not contemplated. Work on such a scale can best be undertaken at a gas-works, the Board collaborating, of course, in the work and directing it. The point is that the creation of the Gas Research Board is in no way intended to supersede the large amount of work which has been and is being done by individual effort. Rather it is hoped that the fundamental investigations undertaken by the Board will lead to an increase of the development work carried out by the Industry itself. The success of the Board's activities will depend on active and wholehearted co-operation. Co-operation will be the mainspring of Dr. King's endeavours, and to make this co-operation effective the Board should have appropriate headquarters.

At the moment the new Director has his headquarters at Gas Industry House—obviously, in view of his aims, an unsuitable arrangement which, we hope, can only be regarded as a temporary expedient. From the point of view of the work of the Board and of the prestige of the Gas Industry, it is desirable that steps should be taken to establish adequate premises where staff can be housed, with laboratory and library facilities. Plans, we suggest, should be drawn up for accommodation of the nature, and though it may not be thought fitting, or, indeed, may be impossible, to start building, we suggest that a move could at least be made for the acquisition of an appropriate site for future development. We have in this note merely indicated a few of the aims of the new Director; we think they are aims which call for the Industry's full backing.

That such backing will be forthcoming seems evident from the remarks made by speakers at a meeting of the Midland Association which we attended in Birmingham last Thursday, when Dr. King addressed the members on "Research and the Gas Industry." The Address, which we publish in our issue to-day, "went down" extraordinarily well, as its merit deserved. Dr. King gave a clear outline of his plan of campaign and his method of approach to the matter, concluding his remarks by saying that only by complete accord between the Industry and its research groups will it be possible to achieve the best results. We are optimistic enough to believe there will be this accord. The breadth and scope of the field to be covered were indicated in the Address. Certain subjects of grave importance to the Gas Industry are not yet covered by research associations; and in this regard Dr. King expressed the hope that those concerned with coke and tar would act in liaison with the Gas Research Board, so that their researches where desirable could be taken care of under the auspices of the Board. The problems concerned in the manufacture of coke are of common moment to the Gas Industry and other coke interests, and we can visualize the advantages of combined attack on problems. Similarly, tars present some problems which could be studied advantageously by one group. Besides outlining a plan of campaign, Dr. King dealt in small compass with lines of research—a brief survey which we found most stimulating and encouraging, an impression which, we think, will be shared by all who study the Address.

B.C.U.R.A.; B.C.I.R.A.

THE foregoing note has been concerned largely with the provision of accommodation for the Gas Research Board, not, say, twenty years hence, but now. In our view, the merit of research is not to be measured by the number of square feet of laboratory accommodation available; there should be an excess of ideas over income; and we want genuine co-operation among the several fuel research associations. The notion of one research association vying with another on the output of research communications or the number of white-coated assistants employed does not appeal to us in the least. On the other hand, we think there ought to be sensible equipment and facilities at the disposal of research workers. Responsible scientists view with concern exaggerated claims, and just as a scientist cannot be made in a day, though he might be born in one, so we have to bear in mind the inevitable time-lag in research and organize accordingly. And it is with co-operation, not competition, in our mind that we take a look at what the other fellow is doing, "fellow" being "one associated with another" (C.O.D.).

The day before the Birmingham meeting of the Midland Association we attended the opening of new laboratories for physico-chemical research at the British Coal Utilization's premises at Coombe Springs, Kingston, a highly salubrious spot. They were opened by Sir Edward Appleton, Secretary of the D.S.I.R., who suggested that the steps recently taken by B.C.U.R.A. were some of the first notable signs of a great forward movement in industrial research which he confidently expected would be one of the features of post-war Britain. This constitutes very considerable praise. Sir Evan Williams, referring to finance, mentioned the creation this year of the £1,000,000 fund for the five-year plan of B.C.U.R.A., adding that when the Association felt it required more money, more money would be forthcoming. Now the Kingston Laboratories are only a temporary measure, but they are really quite commodious and are well equipped. We were much impressed with the research facilities they afford, facilities which should stimulate and encourage those engaged in the work in them. Looking ahead, however, the Association has acquired a site of 20 acres at Leatherhead, and it is there that the permanent research station will be erected after the war. Perhaps the final building will be something of a show-piece; we think, at any rate, that it will be undertaken in no spirit of half-measures. In the meantime Sir Evan Williams assured those present at Kingston last Wednesday that the Association in its temporary abode was going ahead to give the people of this country what they wanted —coal fires and cooking and hot-water appliances, an obvious demand (in the Association's view) shown by a recent investigation by Mass Observation. Also in the meantime the Director of the Gas Research Board has a small office at Gas Industry House; centrally situated, it is true, but hardly calculated to fire the imagination or to create inspiration. We trust that even a state of world war will not hinder the Gas Industry, where it has not hindered others, in the immediate formulation of plans and the putting of them into effect at the earliest possible date. Clearly we have leeway to make up.

From B.C.U.R.A. we turn to the British Cast Iron Research Association, and contemplate what it effected a month ago. May 28 last saw the opening of the Association's laboratories at Bordesley Hall, twelve miles outside Birmingham. We have not actually visited these premises, but we have heard a good deal about them and have seen many photographs. The grounds of Bordesley Hall cover 15 acres, and we understand that visitors there are apt to show considerable interest in the gardens as well as in the research carried out in their midst. The buildings and grounds, we would mention, represent a capital investment exceeding £11,000. An additional £5,000–6,000 on equipment has been authorized by the Council, and further additions to this are contemplated in order to enable the Association to play its part in assisting the industry to meet post-war problems. There is a library and there is an information bureau. Total expenditure is estimated to work out at about £25,000. We repeat that in our opinion the value of research is not to be measured in the number of square feet of laboratory accommodation or the acreage of delightful grounds and gardens; but the examples we have quoted of B.C.U.R.A. and B.C.I.R.A. are there for not only the Gas Industry, but for all the world to see.

Personal

On medical advice, Mr. A. MACKAY, M.I.Mech. E., is resigning as Chief Engineer and General Manager of the Stoke-on-Trent Gas Department with effect from the end of September.

Mr. Mackay's early technical training was with the Glasgow Corporation Gas Department, and for seven years he was Assistant Engineer at the Dawsholm Works. Subsequently he was Engineer and Manager successively at Montrose and Motherwell. When he went to Stoke in 1917 there were four separate works owned by the Corporation, while the central part of the district was supplied from a works owned by a company. Mr. Mackay planned a complete scheme for acquiring the company's works, erecting plant more than to double the capacity of those works, with the necessary distribution system; and closing down the four old works of the Corporation, and one of the company's works situated at Tunstall. This was the first gas centralization scheme attempted on such a scale, and it resulted in drastic reductions in the price of gas, with especial repercussions on the industrial load, particularly in pottery firing. Up to the outbreak of war the increase in industrial usage had amounted to 442%. In spite of all difficulties, the low rates for gas prevailing before the war have remained unchanged.

* * *

Mr. JOHN E. STANIER, G.M., M.I.Chem.E., present Deputy Gas Engineer, has been appointed to succeed Mr. Mackay as Chief Engineer and General Manager. Mr. Stanier joined the Department nine years ago as Assistant Engineer, being promoted a year later to the position of Deputy Engineer. Prior to going to Stoke he was with the Stockport Gas Department for 15 years.

* * *

Mr. L. A. THORMAN has been appointed Regional Gas Officer at Nottingham to the Ministry of Fuel and Power. He will work in close collaboration with Mr. George Dixon, the Regional Gas Advisory Officer.

* * *

Mr. J. F. RUST, Engineer to the Newport (Mon.) Gas Company, has been appointed a Director of the Ross Gas Company, Ltd.

Obituary

With great regret we record the death earlier this month of Mrs. TARRATT, wife of Mr. Frank P. Tarratt, formerly of Newcastle upon Tyne. By her happy disposition and unfailing sense of humour Mrs. Tarratt endeared herself to many in the Industry, especially during her husband's Presidency, in 1933–34, of The Institution of Gas Engineers.

* * *

The death has occurred at Inverness of Mr. ANDREW THOMSON in his 66th year. He had been Engineer and Manager of the Inverness Corporation Gas Department since 1903, in which year he succeeded his father, who had been Manager since 1875. Mr. Thomson is survived by three sons and a daughter.

Letters to the Editor

Sulphur—What are We Going to Do About It?

DEAR SIR,—I have read your Editorial Notes in your issue of June 23 with great interest. There are times when plain speech is required, and this is one of them, yet I feel that the castigation of the Industry administered on this account is not warranted. It is no use flogging a willing horse, and there are a few, even in the Gas Industry.

I consider that many, if not all, gas engineers think "Sulphur must go," but, unfortunately, sulphur will not obligingly disappear when it learns that it has overstayed its welcome! It has to be extracted and rejected. The problem is, How?

Extended oil washing for benzole, or benzole extraction by the activated carbon process, will remove the sulphur down to 9 grains or so per 100 cu.ft.; but this, I consider, is only a minor improvement. Much more drastic removal is necessary if there is to be an important improvement in the products of combustion. I think that the goal is one grain or less.

To quote your notes, "Every chemist outside the Industry knows that the technical difficulties in its removal do not exist." Apparently every chemist or, at any rate, every engineer inside the Industry considers that they do and are most formidable. If this is not the case, then there is something seriously wrong in the Industry's information service. So far as I am aware, there is only one plant working on sulphur extraction of this order, and little, if any, information has been disclosed. If this plant is only yet in the development stage

then the Industry cannot be blamed for not installing similar units on a large scale. If, on the other hand, the plant has passed beyond this stage, why should we not have been told about it? Surely it is somebody's job to keep the Industry informed on major developments. Perhaps you, Sir, can help in this direction.

Recently I had the pleasure of attending a meeting of the Midland Association of Gas Engineers to hear Dr. King, the Director of Gas Research. At that meeting I made the suggestion that local research associations or committees be set up for the purpose of—

1. Maintaining the closest liaison between districts and the Research Board and to stimulate and maintain interest in research and the progress made.
2. Advising the Research Board of suitable works where experimental plants might be tried out. (It would be preferable that new types of plant which it is desired to encourage should be tested in various well separated areas, so that they could readily be inspected, and information as to performance would spread rapidly.)
3. To assist the Research Board in accelerating the translation of research into practice.

It may be that existing bodies such as the Regional Gas Engineering Advisory Boards would be best equipped to carry out this duty. I am concerned not so much as to who does it, as that it should be done. The days when research was something we discussed once a year are gone.

The Cheltenham and District Gas Company.
June 26, 1943.

Yours faithfully,
CHARLES R. INGHAM.

Co-partnership

DEAR SIR,—The statements made by "Futurist" in your issue of May 26 appear to be so extravagant that it is not easy to believe that his views have been derived from personal experience. My own association with the pioneers of co-partnership in the Gas Industry ranges over a period of 41 years; and your readers may judge whether the co-partnership rewards in this undertaking (South Metropolitan Gas Company) "are not sufficiently tangible," or "not immediately evident." In passing, it may interest "Futurist" to know that the writer has had a seat on this Company's Board as an Employees' Director (Staff Section) for upwards of 13 years, and that two of his colleagues thereon are also Employees' Directors, representing the weekly and hourly rated employees. A number of other co-partnership undertakings provide for their employees to be similarly represented—*e.g.*, South Suburban and Commercial. For this, of course, sanction is required from both the shareholders and the Board of Trade.

Our profit-sharing scheme was inaugurated in 1889, and developed into co-partnership five years later—two widely different propositions. The following is a synopsis of our profit sharing and co-partnership figures since the year mentioned:

Bonus credited to Employees' Accounts	£1,815,300
Voluntary savings ,, ,, ...	1,138,800
Interest on savings and bonus	244,200
	£3,198,300
Bonus and savings voluntarily transferred from the Cash (or Withdrawable) Account for the purchase of Ordinary Stock in the Company	£640,100
Total of bonus and savings invested in such Stock	£1,555,100

The value of Ordinary Stock held by co-partners, together with the amounts standing to the credit of their co-partnership accounts on the outbreak of war, was £762,300. Since then the comparatively small amount of £1,700 has been realized by co-partners from the sale of stock, the reasons for the sales largely being due to circumstances of a special character arising out of the war.

The Co-partnership Committee of Management administers the Company's Co-partnership, Pensions, Accident, and Insurance Funds, the Company having contracted out of the Workmen's Compensation and National Health Insurance Acts. Such a parent Committee is an integral part of our co-partnership. It not only performs exceedingly useful functions in its administrative, consultative, and representative capacity, but acts as a safety valve to the employees, and makes for better understanding between employer and employee. (There has been no repetition of our employees' costly strike in 1889.) And yet "Futurist" informs us that "The value of co-partnership as an incentive is NIL."

It is difficult to understand how "piece-rate systems ousted co-partnership in many industries," because, if such systems increased the earnings of employees, the corollary would be that the profits of the undertaking concerned would be also increased. On what grounds does "Futurist" presume "that piece-rate systems make up for the lack of incentive in co-partnership?" It is a bold statement to affirm, and unfortunate if, where he has been employed, his experience has been the exception to the rule.

Co-partnership benefits are invariably based on the signing of service agreements. If, therefore, an employee has thereby accepted the conditions of co-partnership (a primary object of which is the acquiring of stock in the undertaking by the employees), can there be any valid reason for objection by an employee for not being permitted to withdraw bonus with impunity from his co-partnership account? On the other hand, withdrawals are allowed in times of difficulty, and for house purchase, marriage, and other reasons. There is no obligation for an employee to sign a service agreement, and thus embrace co-partnership, but they all seem to like to do so; and it should be emphasized that the allocation of bonus is made from surplus profits, and is additional to the scheduled rates of wages. How, then, can the recipient complain of the conditions to which he has become a party? But there is something far more important than to be able to supplement wages through bonus withdrawals, namely, to have a "nest egg" for a rainy day. Many of our pensioners who, when they were *labourers*, were encouraged not to withdraw their bonus, and who took advantage of saving facilities, now own their own houses and plots of ground, have money invested, and are happy and contented citizens. Should death overtake the husband first, has not co-partnership, plus thrift, been worth while if the widow experiences some sense of independence? I do not know of any "compulsory method of co-partnership," and I am not aware that many co-partnership schemes subsidize pensions funds. In my Company the bonus allocations are credited in equal proportion to the cash and stock accounts. Bonus cannot be withdrawn from the latter account except for stock purchase. For this, opportunity is normally afforded annually when co-partners can purchase stock by using the money on the stock accounts, by transferring sums from the cash accounts, and by adding dividends and savings. (Some co-partnership undertakings permit withdrawals from their withdrawal cash accounts without let or hindrance.)

I would say that co-partnership helps a man to become a better citizen, enables him to earn a stake in the undertaking he serves, and assists him to face what, in these days, is a very uncertain future. Of all the mundane benefits accruing from co-partnership the most important to the individual is security of employment; then there are the Committee of Management, the Employees' Directors, and the bonus allocations. Co-partnership, interpreted aright, is brotherhood in business, and that is the greatest factor of all. Co-partnership seeks to give rather than to receive.

South Metropolitan Gas Company,
June 24, 1943.

Yours truly,
V. HEWES,
Co-partnership Secretary.

New Laboratories of B.C.U.R.A.

On June 23 new laboratories for physico-chemical research were opened by Sir Edward Appleton, Secretary of the Department of Scientific Research, at the British Coal Utilization Research Association's premises at Coombe Springs, Coombe Lane, Kingston. These laboratories, quite extensive and well equipped, are a temporary measure, for the Association has acquired a site of 20 acres at Leatherhead, where a permanent research station is to be erected after the war.

Sir Evan Williams, who presided, said the laboratories had been erected to replace those at Fulham destroyed by enemy action. The Association could scarcely have grown to its present stature had it not been for the keen interest, the patient advice, and the financial assistance given from its inception by the Department of Scientific and Industrial Research. One of the problems of research, he added, was to give the people of the country the coal fires and the cooking and hot-water appliances they wanted, but to make them thoroughly efficient, highly economical, convenient, simple to operate, clean, and practically smokeless. He thought the problem had been solved. Great progress had been made with the practical development of producer gas as an alternative fuel for road transport. The producer itself had been brought to the stage where it gave highly satisfactory and competitive results under strict tests and operative conditions on the road, and in activated coke he thought there had been found the fuel of the future for road transport. The Association was inviting the mineworkers to appoint members to its Council.

Sir Edward Appleton, in opening the laboratories, said the steps recently taken by the Association were some of the first notable signs of a great forward movement in industrial research, which he confidently expected would be one of the features of post-war Britain.

Mr. Will Lawther, President of the Mineworkers' Federation, said he believed that the coal industry could be developed to an extent never known before.

The Institution of Gas Engineers

Dr. W. E. LE B. DIAMOND, M.A., A.I.C., F.C.I.S., who has been Assistant Secretary of The Institution of Gas Engineers since 1937, has been appointed General Manager of the British Plastics Federation.

Diary

July 6.—B.C.G.A. Full Executive Committee at Gas Industry House, 2 p.m.

July 19.—London and Counties' Coke Association Committees: Finance, 11 a.m.; Executive, 11.30; Central, 2 p.m.

RESEARCH AND THE GAS INDUSTRY*

By Dr. J. G. KING

Director of the Gas Research Board

I PROPOSE to outline to you briefly how the Gas Research Board is constituted, but mainly to indicate what the Board can do to foster research throughout the Industry.

In the first place, the Board was registered in 1941 with the Board of Trade as an Association limited by guarantee. Its objects cover many points in the articles of association, but can be crystallized for our present purposes into the two following main heads :

(1) to promote and support researches both at a central establishment and by the provision of funds to independent workers;
(2) to disseminate research information to the technical staffs employed in the Industry.

I do not propose to explain the exact articles of association; it is sufficient to say that the Board is managed by a Council of 15 to 20 members (9 from The Institution of Gas Engineers' Council and 6 from the S.B.G.I. Council), and its present Chairman is Mr. E. V. Evans. At its inception, the Board took over the research staff working under the joint research committee of the I.G.E., but did not appoint a Director until now. This was the original arrangement, but an important change directly preceded the appointment of the Director in that the Board became affiliated with the D.S.I.R. as a Research Association.

The idea of the formation of Trade Research Associations subsidized by Government was conceived by the Advisory Council for Scientific and Industrial Research in its very earliest days. In 1916 the Department of Scientific and Industrial Research was formed, and Parliament placed at its disposal a fund of a million pounds sterling to enable it to encourage industry to undertake research. The intention was that the fund should be expended on a co-operative basis in the form of liberal contributions by the Department towards the income raised by voluntary associations of manufacturers established for the purpose of research. This intention has been pursued and numerous Trade Research Associations have been formed. The Gas Research Board is now one of these.

It ranks, therefore, as an industrial research association of the D.S.I.R., and as such benefits to a real extent financially by a grant whose magnitude depends upon the amount subscribed by industry itself. It will be clear to you that there is an added incentive here to give the Board full financial support, with the knowledge that this support will be added to from Government funds. It is very important that the total should make adequate provision for the prosecution of many and diverse problems which must be tackled. Already a firm financial basis has been formed upon which to make a start, but if results are to come quickly we must visualize a real expansion, starting even under war conditions, and accelerating as soon as these have passed. It is interesting to observe that the average expenditure by 16 research associations varies from 0.007 to 0.14% of the annual turnover of the industry, with an average of almost 0.05% I hope to see the Gas Industry increasing this average.

The time to prepare plans is now, and I should like to put before you a plan of what may be done, to ask for your advice in perfecting that plan, and your co-operation later in putting it into effect without delay.

Before I say more about a plan I must refer to what has been done already. Since 1919 the research workers of the Institution have done valiant work at Leeds; the larger gas undertakings have gradually formed research schools, the Fuel Research Board have done some work at Greenwich, and the Coke Research Committees of the B.I.S.F. have made their contribution.

One must not assume, therefore, when discussing a fresh start now, that there is no background of research work. The Leeds groups alone have contributed 46 scientific papers up to 1939 upon a diversity of subjects, including studies of calorimeters, of gas-making plant of different types, of combustion and burners, of ammonia recovery, of effluents, and finally of total gasification in a two-stage process which is fundamentally different to anything we have seen before. The latter is at present the main line of research, and I will deal with it more fully later.

The Fuel Research Board have over the same period contributed 37 official Papers and 44 Journal Papers of direct interest to the Industry. These have covered studies of calorimeters, of gasification plant, of coke and tar, and have included more fundamental studies of the hydrogenation-cracking of tar and tar components. The Coke Research Committees of the B.I.S.F. have also contributed over 20 Papers. I have not attempted to count the number published by the research staffs of the larger gas undertakings, but in this connexion there are many Papers covering fundamental as well as industrial research.

The situation has now changed, however, since I feel that a time has come when the Gas Industry must take primary responsibility for all the researches bearing upon its own processes and products. Whether it carries these researches out with its own staff or by enlisting the assistance of the staffs of other research associations or of the national body, it is my hope that it will be possible to co-ordinate the researches of the Board itself with those of the gas undertakings who conduct research work, so that there will be full co-operation of effort within the Industry and the minimum of unnecessary overlapping. In this way I am confident that not only will the funds of the Board be expended to the best advantage, but that all research staffs in industry will co-operate with the Director so that the results of their researches can be made available to industry as a whole. I say that I am confident that this can be done, although I realize that there are difficulties to be overcome, particularly on the question of the design of appliances and plant and their commercial exploitation, because I feel such difficulties can and will be overcome in a satisfactory manner.

There are, however, other complications where the interests of the Industry and its Research Association impinge upon the interests of other industries and their Associations. Special arrangements will have to be made to carry co-operation into this field also. So far as Research Associations are concerned, the D.S.I.R. have already made a move which should, if applied, quickly produce a working arrangement and ensure its continuance. This move consists in the formation of a Standing Consultative Conference, set up under the Chairmanship of Sir Harold Hartley, and containing representatives of the Research Associations interested in fuel subjects and the Fuel Research Board. It is intended that this conference will so co-ordinate the efforts of the different associations that there will be no unwise overlapping. One would naturally suppose that in the operation of this Conference any particular association would in the main deal with its own research problems, and would have the overriding say in deciding whether any other association should come into the field. It is realized, however, that the workers in one association may have specialized knowledge, and that it would be in the best interests to exchange research programmes in such a way that they were always tackled by the type of staff likely to do them most justice.

The problem is, however, wider than this, in that certain subjects of grave importance to the Gas Industry are not yet covered by research associations. I refer to coke and tar, and I sincerely hope that something should be done soon by those interested in these commodities to form a liaison with the Gas Research Board in such a manner that their researches can be taken care of, if necessary even under the auspices of the Gas Research Board. I am sure that you will agree that the problems concerned in the manufacture of coke are of such common interest to this Industry and to that of coke manufacture that a combined attack is the best method of tackling the subject. In the same way tars, although very diverse in their properties, present problems which can be studied most advantageously by one group.

Fundamental problems on the other hand can affect all the fuel industries, and it will be a matter for arrangement as to who should best conduct the research. I feel sure that there must be some overlapping, since the exact interests of each industry may differ; for example, the combustion characteristics of coal gas which are creating interests at the present moment obviously affect the Gas Industry much more than any other but, since the efficiency of the furnace or appliance is affected, the consumer will also wish to be concerned in any research done.

Plan of Campaign

It will be apparent to you that the proper administration of the Board's work calls first for a central control. In any healthy research organization there should be an excess of problems over facilities, and it will be necessary to use a nice judgment in order to determine—

(1) which problems to attack first;
(2) the scope or scale of the attack;
(3) whether specialized advice is necessary;
(4) where the work should best be done or distributed.

The central station would make all such decisions and distribute the work. It would also cover an intelligence service, laboratories for fundamental research and for the centralizing of analytical work, and a central workshop for the control and maintenance of scientific apparatus.

As regards intelligence work, you all realize that the first action in tackling a new problem is to discover what other people have done and start where they left off. It will be necessary for the G.R.B. to have a real intelligence service which will do this work centrally for its staff. I have recommended, however, to the Joint Consultative Conference that a central bureau should be set up to cover all the fuel intelligence work, and that it should belong to the D.S.I.R. If this is possible the staff directly employed by the G.R.B. would be small and their duties would be only—

(1) to advise the central bureau of the subjects to be covered;

* Address to the Midland Association of Gas Engineers and Managers, June 24.

(2) to help the bureau where necessary with advice of a character peculiar to the Industry;

(3) to collate literature data for research staffs, to save the time of the experimentalists. This would include not only the Board's staffs, but those of members.

It is true that it may never be possible to cover the past, but it is imperative that an early start should be made, so that from now all available data can be sorted, précised, and card-indexed.

A secondary duty would be to take adequate steps to make known to technical staffs in industry not only the results of the Board's own work, but also that of other workers both at home and abroad.

In doing research work there is always a certain amount of routine work to be done, such as analysis of samples, preparation of special apparatus, photography, drawing of apparatus, &c., for publications. These can only be done economically by centralization.

Research into fundamentals calls for laboratory space, both for bench work, and for the erection of intermediate-scale "plants." The central station would have such facilities, although all the fundamental work would not necessarily be done there. Some of it would go on at Leeds under the Livesey Professor, some at other Universities where specialized knowledge or facilities existed, and some for similar reasons at the laboratories of other associations or of the D.S.I.R.

Large-scale work or work involving the handling of large quantities of raw materials or products would be done in collaboration with industry. It would obviously be unwise to expend any real proportion of research funds upon, for example, coal if it were possible, as I am sure it is, to obtain the necessary data from a plant in commercial operation. My own collaboration with Edinburgh is an excellent example, but there are many others; a number of undertakings in the Industry have in fact helped the Joint Research Committee frequently in this way. I would now like to see the general idea of such arrangements accepted widely, since I feel that there is no better way to stimulate interest in research than to bring it into direct contact with production at as many points as possible.

I can see a further service which the Board could render to industry by employing for short periods chemists or engineers intended for works appointments, and thereby giving them an insight into research methods. Such an arrangement could not perhaps have a very wide scope, but I feel sure it would achieve in due course a missionary effect which would be beneficial.

Lines of Research

Now I must say something about the lines of research, which are already fairly clearly indicated. It can be taken as axiomatic that any line of research should be followed which will tend to lead towards greater flexibility and balance in the production side of the Industry, and greater demand, on the other hand, for the products which the Industry has to offer. Public demand is a very important factor in this, but if research can influence it by the improvement of products, then that research is worth while. Secondly, since the demand for fuel for domestic heating is unavoidably seasonal, the development of alternative methods of gas production to preserve at all times a balance in the products sold is of outstanding importance, until by secondary development, a demand for fuel for power and industrial heating, which are less seasonal, can be built up.

Further, it may well be that the post-war Gas Industry may have to contribute in greater measure to the supply of indigenous oil. It already supplies benzole and pitch-creosote fuel in greater quantities than ever before, but it will have to do more. H. L. Ickes, Secretary for the Interior in the United States, has just said (*Coal Age*, April, 1943, p. 54) that the new oil resources being proved in the States are less than current consumption and a new era of "oil from coal" can be expected. Financial considerations may also limit the amount of oil which can be imported. The Gas Industry can help in many ways, but it must prepare now. These ways are (i) reactive coke for the mobile producer, (ii) synthesis of gas of high calorific value for use in cylinders, (iii) liquefaction of methane, (iv) greater production of benzole, and (v) better utilization of tar.

In considering programmes it may be a little difficult to differentiate between true research and technical development. In the case of established processes improvement of efficiency and design by test is probably the latter, and research is limited to the utilization of products, but even here it is unwise to be dogmatic. With new processes, however, research is required from the start, first in the examination of the original idea, secondly in its application to practical things, and thirdly in the examination of the changes in technique which its adoption might bring about.

Coal

In considering research programmes let me start first with your main raw material, coal, of which 18.20 million tons are consumed annually.

Despite all the work which has been done upon the properties of coal there is still a great deal to learn and, although the logical place for fundamental coal research is the Fuel Research Station, I feel that the G.R.B. must itself take a hand if only with special reference to the caking power of coal, since caking power is so often the determining factor in the gasification of coal.

We already know that the reserves of those high-volatile, highly-caking coals to which the name "gas coal" was originally given are decreasing more rapidly than those of lower caking power. This means that it will become increasingly difficult by existing methods to maintain a high thermal yield of gas per ton of coal. Research, therefore, is required to utilize second and even third quality gas coals to get the best out of them. This is, of course, already being done with graded coals in continuous vertical retorts by increasing plant output to balance low yield, but still more work is necessary. An obvious means of balancing loss of revenue would be to increase the value of the other main product, coke, and you will be interested to hear of its successful use as a fuel for automobile traction by producer gas. Modified methods of gasification are necessary, of course, and careful choice of coal, but successful results have been achieved both here in Birmingham, and at Edinburgh, the fuel, particularly from the latter works, having been proved very suitable for the Government Utility Producer. The sacrifice in coke and gas yield would be met by the higher selling price obtainable for the fuel; at the present time this is 110s. per ton.

If a satisfactory method can be evolved for utilizing the fine breeze necessarily produced in the grading of the coke, it is for consideration whether the Gas Industry of the future should not continue to manufacture producer fuel for a limited service on the road. Typical figures in the performance of the Government Utility Producer in relation to a 2-ton truck operating on "medium" distance work are 1.2 lb. of fuel per mile, 1,500 to 2,000 miles per filter cartridge, and an overall road performance which may be expressed as approximately 90% of that when operating on petrol. If the producer fuel can be manufactured at a price of 100s. per ton, the fuel cost for the vehicle running on producer gas is less than half that for petrol operation.

I can assure you from personal experience that, given suitable coals, the operation of a vertical retort to produce coke of this type is a comparatively simple matter. It is still open to question whether it is necessary to activate the coke by impregnation with sodium carbonate, but in many districts, as in Scotland, it is not necessary, since there are coals available of the right type. It has been estimated that in the country as a whole as much as 8 million tons of suitable graded coal are now marketed; this is much more than is likely to be utilized in this way even in a petrol shortage. At the same time we, as I have already said, must seriously consider that petrol may not always be so plentiful.

It may well be that in the future the Gas Industry may continue to manufacture such fuel for its own delivery services than to buy petrol.

The domestic market is also interested in reactive coke of this type. Just before the war the President of the Institution started to make it for the Edinburgh market and had considerable success. I have no doubt but that he will return to it after the war.

Complete Gasification

The introduction of a process of complete gasification has been discussed many times. Its main advantages are probably avoidance of accumulations of coke and the conservation of caking coal. It has also been considered that if part of the equipment of a works included a complete gasification plant, the overall flexibility of that works would be greater. Its greatest defect has been the fact that the gas has a low calorific value.

One process of complete gasification (Lurgi) has proved successful in Germany owing to the availability of reactive brown coal and of relatively cheap oxygen. The great advantage of the process is that the conditions of gasification are such that methane is synthesized, and the gas produced need not be lower in calorific value than our present level. I feel that it is quite time serious consideration was given to the erection and trial of a unit plant in this country, and to the possibility of obtaining a sufficiently cheap supply of oxygen. The Lurgi "generator" is essentially a gas producer which operates at a pressure of 20 atmospheres (300 lb. per sq. in.), using a blast gas consisting of oxygen and steam. The oxygen need not be quite pure, and the most promising process for its manufacture would seem to be the Linde-Frankl liquefaction process. This can be operated cheaply on a fairly large scale, but it does not seem too optimistic to consider that it could be manufactured in this country at about 6d. per 1,000 cu.ft. At this price the cost in terms of town gas manufactured would be of the order of 0.3d. per therm.

The Lurgi process operates as it does because the reactions $C + 2H_2 \rightleftarrows CH_4$ and $2\,CO \rightleftarrows C + CO_2$ are both displaced towards the right by increase of pressure. At atmospheric pressure, as you know, very little CH_4 is formed in the water gas process, but at 300 lb. per sq. in. pressure the percentage of CH_4 may be as high as 22%. Since the second reaction cannot be inhibited, the process involves washing with water under pressure to remove the CO_2. This is not altogether a disadvantage, since the same washing removes practically all the sulphur and reduces purification costs.

On German brown coal the yields per ton are approximately 46,000 cu.ft. of gas at 500 B.Th.U. or 230 therms with a consumption of oxygen and steam of about 32 cu.ft. and 1.5 lb. respectively per therm.

We do not know whether the process would operate satisfactorily on British coal, though it almost certainly would on a reactive coke, but I feel that, at some not too distant date, a full scale experiment should be made in collaboration with a firm like the British Oxygen Company. The question of cheap oxygen could wait until the suitability of British coals and cokes had been explored.

The Gas Research Board workers at Leeds are extending even this proposal by postulating a second stage, which is essentially the hydrogenation of coal at a pressure of 750 lb. per sq. in. In one form their proposal is to balance, as a two-stage process, the gasification of coal with hydrogen, and the manufacture of the necessary hydrogen (or gas rich in hydrogen) by the gasification of the semi-coke, produced in a Lurgi generator such as I have just described.

The gas made includes, of course, ordinary distillation coal gas, but is diluted by methane formed by the reaction of the hydrogen with the coal; the idea would be in a complete process to continue the reaction so far as possible while still leaving enough coke for the manufacture of the necessary gas in stage 1. One forecast of possible yields is 50,000 cu.ft. of gas at 500 B.Th.U. or 250 therms per ton. Allowing for steam raising the net yield of gas might be reckoned at 210 therms per ton, the composition of the gas being hydrogen 56, carbon monoxide 16, methane 27 and nitrogen 1. About 20 gallons of a light tar would be produced at the same time.

The process is a revolutionary one for the Industry to consider, and contains many difficulties to be overcome, but it is imaginative, and the Board's staff will, I am sure, have your encouragement and sympathy.

This is only a bald statement of one aspect; there are variations which are equally interesting, but you will readily understand how such processes could make the balancing of coke and gas demands quite a simple matter.

Gas of High Calorific Value—Methane Synthesis

Gas of high calorific value is of interest for several reasons: (*a*) As a substitute of petrol, (*b*) thermal storage, (*c*) special metallurgical processes. The process now being investigated by the Gas Research Board would lend itself to this idea, but perhaps a more interesting method is the catalytic production of methane from water gas or coal gas. Experiments to this end have been going on both at Leeds and at the Fuel Research Station.

The reactions studied are:

(1) $CO + H_2 \longrightarrow CH_4 + H_2O$,

(2) $2CO + 2H_2 \longrightarrow CH_4 + CO_2$,

so that it will be apparent that purification of the final gas from CO_2 is necessary.

The catalyst used with success at the Fuel Research Station is a nickel-thoria-kieselguhr combination which works at a temperature of about 350°C. and at atmospheric pressure. The difficulties in the process are (*a*) the purification of the water gas to less than 0.1 grain S per 100 cu.ft., (*b*) the design of a reaction chamber which will allow of ready dissipation of the high heat of reaction and a long-lived catalyst. One feature of the process is the rapid rate of reaction; a catalyst chamber of only 12 cu.ft. capacity would convert one million cu.ft. of water gas per day.

As a gas-making process one would visualize a series of catalyst chambers recharged in turn so as to maintain the average gas produced at 65% methane. So far it has proved possible to operate for 120 days on one charge of catalyst, so that the output could be 10.7 million cu.ft. of process gas per cu.ft. of catalyst space. With efficient heat interchange the thermal efficiency of conversion of the process is about 75%. Whether it would be used to enrich water gas without using indigenous oil, to upgrade the calorific value of coal gas from, say, weakly-caking coals or to make from either gas a high C.V. gas would depend upon local conditions. Under the experimental conditions quoted above the gas would have a calorific value of 725 B.Th.U., and it is interesting to speculate what the Industry might do with such a gas. Its high calorific value reopens the question of road transport in steel cylinders, and its high methane content suggests possibilities in relation to liquefaction.

The production of liquid methane from natural gas has gone a long way in the United States, and some pioneering work is now going on in this country with the idea of utilizing the product as a motor fuel. Successful trials have already been made on a lorry and a 'bus. The Gas Industry comes into this picture also in several ways: (*a*) *via* methane synthesis, (*b*) by the possible extraction of methane from coal gas or coke-oven gas, and (*c*) by the possibility of using liquid methane as a form of thermal storage which could be "on tap" at any time. For example, the E. Ohio Gas-Works at Cleveland have built three containers of 500,000 gallons capacity each for the storage of liquid methane for use as a reservoir in the winter. These containers are short cylinders with hemispherical ends 57 ft. in diameter and lagged with 3 ft. of cork. The thermal capacity of each tank is about 500,000 therms, and leakage by evaporation is only 0.2% per day.

The leakage, of course, goes back to the mains and is not lost. The value and flexibility of liquid methane as thermal storage is beyond question; what we should consider is whether its use could be applied at a reasonable cost. In the U.S. project 1¼ million dollars were spent on a plant to liquefy 4 million cu.ft. of natural gas per day. In 1940 the costs amounted to 37.1 cents per 1,000 cu.ft., or about 1.85d. per therm. The consumption of gas at Cleveland is about 400,000 therms per day for industrial purposes only, so that the thermal storage is not a high proportion of normal output.

Hydrocarbon Synthesis (Fischer-Tropsch Process)

The synthesis of liquid hydrocarbons from carbon monoxide and hydrogen by the Fischer-Tropsch and allied processes is of importance to the Gas Industry, because the main raw material is gas, whether dealt with as such or manufactured from coke or coal.

The process started operation in Germany on an industrial scale during 1936, and has developed rapidly to the production of, we believe, 2 million tons of liquid products per annum.

So far, experimental work on the process has been limited to the Fuel Research Station and to Synthetic Oils, Ltd., and only pilot plants have been operative. Gases containing carbon monoxide and hydrogen, preferably in the ratio of 1 : 2, are purified from sulphur to less than 0.1 of a grain per 100 cu.ft., and passed over a cobalt catalyst at temperatures ranged between 175–220°C. either at normal pressure or at 5/10 atmospheres' pressure (medium pressure process). Approximately 120 gm. of liquid product was obtained per cubic metre of gas treated at atmospheric pressure or 150 gm. at 10 atmospheres.

The composition of the total hydrocarbon products is:

	Normal pressure.	Medium pressure
Methane	18% by wt.	11% by wt.
$C_3 + C_4$	11% ,,	7% ,,
Oil below 200°C.	43% ,,	21% ,,
200–320°C.	20% ,,	28% ,,
Wax	8% ,,	33% ,,

To the Gas Industry the methane would be valuable as a bottled gas of high calorific value. The C_3 and C_4 gases could be used similarly or as a source of chemical products. The motor spirit is of low octane number, but the diesel oil is the best known. Perhaps the greatest value to the process however lies in the possibility of treating the primary products so as to produce from them products suitable for chemical industry. I visualize this process in the Gas Industry as one which could be used to balance the production of coke and gas, and to provide for treatment elsewhere a preparation of raw material suitable for chemical industry.

The raw material in the process can be either coal, coke, or gas, and the net efficiency for production of oil is of the order of 1 ton of oil from 3.3 tons of raw material.

Removal of Organic Sulphur Compounds

After the removal of hydrogen sulphide from coal gas it normally contains about 30 grains or more of organic sulphur per 100 cu.ft. This is present as carbon disulphide, carbon oxysulphide, thiophene, and mercaptans. By careful selection of coal of low sulphur content it is possible to reduce the amount of organic sulphur in the gas, but this can be done only to a very limited extent in those districts where such coals are available.

The presence of this organic sulphur, therefore, is a problem which the Gas Industry has not completely solved. When the coal gas is burnt the organic sulphur compounds form oxides of sulphur which are corrosive and injurious to health; in some industrial processes their presence affects the value of the product—*e.g.*, special glassware, metal castings. The attention of the Industry has therefore been directed for some time towards the reduction of organic sulphur, and since no method has been found to reduce the amount during production, attention has been directed mainly towards its removal from the finished gas.

The first indication of a suitable process arose in the synthesis of liquid hydrocarbons by the Fischer-Tropsch process. In this process the catalyst is rapidly affected by sulphur, and it was necessary to evolve a process for the complete removal of sulphur before catalysis. This method consists of the treatment of the gas at 200°C. with an iron oxide sodium carbonate mixture. The mixture becomes inactive after it has absorbed about 8% by weight of sulphur, and this limitation makes it too expensive for the purification of town gas.

Experimental work by the Gas Light & Coke Company has shown that oil washing will reduce the sulphur content to 8 to 10 grains, and passage over nickel or cobalt sulphide catalyst under controlled conditions in the presence of oxygen to less than 3 grains.

Other catalytic processes however are possible, particularly those now being examined by the Leeds group, and it does seem possible that we may, in the near future, find a way to reduce the sulphur content of coal gas to 3 grains or less per 100 cu.ft. I need not emphasize the importance which would attach to the removal from town gas of this bogy.

High-Pressure Gas

In this country the term "high-pressure gas" has normally been referred to gas distributed at pressure from 5 to 15 lb. per sq. in., as in the Halifax and Plymouth experiments.

Much higher pressures have, however, been used in the United States and in Germany, and it is not beyond the scope of possibility that they might be applied also in this country in the form of gas grids. In the Ruhr district gas distribution at pressures up to 360 lb. per sq. in. began to develop as long ago as 1926, the technique being used to convey coke oven gas to towns and to distribute gas from central works. It is estimated that the steel pipes used have a life of about 30 years. They may be about 25 in. in diameter, of solid drawn steel with welded joints and junctions. The pipes have normally been extended 3 ft. below the ground, but sometimes overhead support has been used.

The pressures used have varied from 40 to 350 lb. per sq. in., depending upon circumstances, but it is interesting to observe that at these pressures a very long pipeline would store a not inconsiderable quantity of gas. Distribution of gas under pressure involves a number of problems, many of which are already known to you, but if gas is to be distributed over wider areas in post-war years, it does seem that even greater consideration should be given to high-pressure distribution systems.

The Gas Turbine

The explosion type of gas turbine developed by Holzwarth on the Continent did not lead to any real application of the principle, but recently new interest has been developed for the so-called combustion gas turbine, and it is possible that it now has better prospects which could reflect upon the Gas Industry. The new principle involved is to couple to the turbine an axial compressor for compressing the air. The fuel is then burnt in this air to raise its temperature before it passes to the turbine. It is reported by the Diesel Engine Users Association that the working pressure is of the order of 36 lb. per sq. in., and the maximum gas temperature usable 1,000°F. Under these conditions an overall thermal efficiency can be obtained of 18%. By the addition of an intermediate re-heating stage and a heat exchanger this figure can be raised to 23%.

It is possible that new advances in the manufacture of steel will make it possible to use a higher gas temperature. This at present is the limiting factor, but it may be possible to overcome the difficulty by studying methods of combustion so as to obtain very high rates of heat release in a small volume; the efficiency of the turbine itself is stated to be over 85%.

Developments on these lines which brought the efficiency of the gas turbine higher would make a real difference to the Industry, in greatly increasing the quantity of gas used for power production.

Recovery of Benzole

During the war the recovery of benzole by the Gas Industry has been very greatly stimulated, and I cannot see that this stimulation should be allowed to lose its effect in post-war years; rather should the Gas Industry do the best it can to raise the recovery of benzole to a maximum by introducing new and more efficient plants after the war, and to study methods of increasing the yield of benzole so that the Industry can help to avoid part of the importation of petroleum oils.

The main objection to the full recovery of benzole lies in the sacrifice of 8/10 B.Th.U. in the calorific value of the gas, which results from each gallon of benzole stripped per ton of coal. It does not follow, however, that research could not find some way of modifying carbonizing conditions which would not only overcome this difficulty, but perhaps even increase the yield of benzole. This is particularly interesting in connexion with vertical retort practice, where the benzene content of the product is low because the conditions of cracking of the volatile products are not too favourable. I have myself been interested in this problem, and my preliminary experiments have indicated that the composition and yield of vertical-retort benzole can be quite appreciably modified.

Toluene will not be in demand to the same extent after the war, but every gallon of spirit the Industry can make then will mean one gallon less of motor spirit which will have to be imported. Every increase in the benzene content of vertical-retort benzole will also mean something in terms of octane number. There seems no real reason why the Industry should not contribute 50 million gallons of benzole to the post-war fuel problem.

The use of active carbon instead of oil for the recovery of benzole is another subject which should interest the Gas Industry, since it is within their compass to manufacture from coal in their own retorts a carbon sufficiently active for the purpose. That this can be done has been indicated by Fuel Research Technical Paper 44.

Physics and Gas Utilization

The research field here is very wide and, although many aspects have been continuously studied by the gas undertakings, and by the appliance makers, it seems apparent that the attack must be made wider, and that fundamentals such as the combustion characteristics of gases, high speed combustion, comfort values in domestic heating, all require more intense study. This is a wide subject which I have not time to do more than indicate now.

Finally

The G.R.B. is about to enter a new sphere of increased activity which will be watched with great interest by all technical people in the Industry. The success which I hope will attend its efforts will be all the greater if I can be sure not only of your interest but also of your help. There is no one too obscure to help, and it is to be hoped that modesty will not prevent anyone with ideas from bringing them forward. If even a small proportion of these were successful that would be well worth while. Secondly, a trained research personnel may well pick out, from what may be only the germ of an idea in the mind of the originator, something well worth developing.

Only by complete accord between the Industry and its research groups will it be possible to achieve the best results.

DISCUSSION

Mr. C. F. W. Rendle (Redditch), proposing a vote of thanks to Dr. King, expressed the belief that they were entering upon a new era of co-operation, and he thought that all would acknowledge the fact that they owed a great deal to the Juniors in the Industry. He was somewhat in a dilemma concerning where research passed from being research and became development work; he found it difficult to conceive of any sharp dividing line between the two, but he thought the Industry was ready and anxious to apply in practice the findings of research. Regarding the elimination of sulphur from town gas, Dr. King was, he thought, talking to the converted, but the only process for the purpose available was an unprofitable one, and he wondered whether a hydrogenation method would be found preferable to an oxidation method. And in the oil-washing process they were "passing the buck," as it were, to the benzole producers. Dr. King, in his Address, had shown himself to be a man of vision, and he could assure the new Director of the G.R.B. that he could count on their co-operation.

Mr. G. C. Pearson (Birmingham), seconding the vote, said how he had enjoyed and benefited by working alongside technicians, recalling how, several years ago, Dr. Parker had, in carrying out his investigations at Birmingham, helped them to tune up their plant. Concerning pilot plants, if they erected such plant on their works they really got down to practical considerations.

Mr. T. F. E. Rhead (Birmingham; Vice-President of the Association, who occupied the chair in the absence of the President, Mr. A. H. Cranmer) paid tribute to Leeds University and to Professors Smithells, Cobb, and Cohen, whose work had saved them from all sorts of difficulties. Research was a laborious and continuous search after truth; it was in a way mundane work and they should not be blinded by the high spots. Research was the hope of the future. To maintain its standard of living after the war the country would have to increase its export trade, and research on coal would provide new products for export, and this pointed to the responsibility of technicians in the Gas Industry. Research begot research, and he had no fear that a co-operative association would stop individual research. The Gas Research Board would act as a focus and help to make them research-minded; and he thought it would result in the Industry's being able to attract better brains.

Dr. C. M. Walter (Birmingham) also said how difficult it was to draw a dividing line between research and development, expressing the view that much development work remained to be done on research work which had already been carried out. Development on heat interchange was one example. The research worker, he thought, should actively assist in development work, and they could only carry out such work on an industrial scale and with the co-operation of industrialists. Part of the cost of the development might well be borne by the industrialist and part by the gas undertaking or the Gas Research Board, and it should be remembered that there was always a time-lag between the findings of research and their application in practice. He considered that there was a bright future for the use of methane and gas at high pressure in the internal combustion engine, and this was tied up with engine design. Most work to date had been undertaken with existing types of engine, and many of their difficulties had been due to engine design. Highest promise, he thought, lay in the use of liquefied methane used in an appropriately designed engine.

Mr. A. W. Smith (Birmingham) said the Gas Industry was to be congratulated on the appointment of Dr. King as Director of the Gas Research Board, and he suggested that the research personnel should be closely associated with the development side of the work. Research staff should be available to visit gas undertakings and give them help and advice. In his view, the Gas Research Board was bound to increase the importance of individual research.

Mr. C. R. Ingham (Cheltenham) considered that there was room for district research associations affiliated to the Gas Research Board. Problems could be tackled in districts, the Midland district, for example, dealing with one subject, and the Manchester district with another, and so on. He would also remark upon the question of the elimination of sulphur from town gas, suggesting that the comments of the "GAS JOURNAL" in its editorial in the issue of June 23 were rather too severe. The only process they had available was one which reduced the sulphur to round about 9 grains per 100 cu.ft., and it was one which pushed the sulphur into the benzole. They must first get a suitable process, one which they could see, not just on paper, but in actual day-to-day working.

Mr. F. C. Briggs (Dudley) admired the practical outlook of Dr. King on this question of research. Time was urgent, and he had in mind the translation of research into practice. In his opinion, if research was to be of any value it must be tried out on the works in a practical way. He thought the Gas Research Board could look to help from the Gas Engineering Advisory Boards on such matters as the location of pilot plants.

Mr. K. L. Pearce (Bilston) said that on this question of sulphur removal they had to consider that it cost money. The industrial consumers in his area of supply were quite happy with the gas as he distributed it. Why, therefore, should he take out the sulphur? And he suggested that where a sulphur-free gas was needed for a particular process they might consider the installation of sulphur removal plants *in situ* at industrial works.

Mr. **Rendle** said he heartily disagreed with such a suggestion.

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Dr. King, replying to the discussion, said that the note he warmly sounded was that of co-operation in research. Research must be balanced; without balance, he could not visualize the proper success of the Gas Research Board, and he looked forward to research workers of the Board working alongside research workers in the Industry. He would divide research into four stages: fundamental, intermediate, pilot plant, and commercial. And pilot plant must always be under the control of the practical technical operator. Regarding the internal combustion engine, Dr. Walter favoured liquefied methane. He personally considered that compressed gas also had possibilities. Regarding the setting up of district research associations, as had been suggested by Mr. Ingham, he did not consider this a wise move, believing that if they dissipated the efforts of the main group they would not achieve as much as could be achieved by a central organization.

South-Eastern Gas Corporation

The Eleventh Ordinary General Meeting of the South-Eastern Gas Corporation, Ltd., was held on June 24 at Gas Industry House, London, S.W. Sir David Milne-Watson, Bt., LL.D., D.L., the Chairman, presided.

The following is from the statement by the Chairman circulated with the report and accounts:

An Order of the Ministry of Fuel and Power prevents me from giving any information as to the working of the subsidiary companies, and I can, therefore, only deal with the figures shown in the accounts of the Corporation.

Taking the balance-sheet first, you will notice that, in accordance with the resolution passed last year, the share capital has been converted into stock. Under the heading of current liabilities there has been an increase in deposits by subsidiary companies, but other deposits and temporary loan have been paid off, so that there is a net reduction of £77,000.

On the other side of the balance-sheet the purchase of additional stocks and shares in subsidiary companies has increased the total amount invested in these companies by £56,000. The loans to subsidiary companies have been reduced by £231,000, one reason for this being that the Slough Company issued £115,000 Preference stock during the year and used the money to pay off its loan from the Corporation. On the other hand, cash at bank shows an increase of nearly £100,000.

It will be appreciated that loans to and deposits by the subsidiary companies are constantly varying according to the cash requirements of the companies. During the war the tendency is for the deposits to increase and the loans to decrease, because much less money is outstanding to finance hire purchase, and because the expenditure on new plant, and even on the maintenance and renewal of plant, has to be kept to the minimum that will enable the companies to meet their war-time obligations.

The revenue account shows that nearly £15,000 more was received in dividends and interest on investments, while other income, which includes interest on temporary loans, is £3,700 less, because of the reduction in the amount lent to subsidiary companies.

On the other side of the account, interest payable is £1,000 more, and income-tax, after deducting the amount recoverable from dividends and interest, shows an increase of £4,000. The net increase in revenue for the year is approximately £5,800. After paying the usual Preference dividends and an interim dividend of 1½% on the Ordinary stock, and taking into account the balance of profit brought forward from last year, there is a sum of £137,119 available for distribution.

Out of this the Directors recommend a final dividend of 2½%, less income-tax, on the Ordinary stock, making 4%, less tax, for the year. This will leave £73,901 to be carried forward. As some of our companies are operating under great difficulties, with considerable reductions in output, your Directors consider the maintenance of the Ordinary dividend at 4%, with an increase in the carry-forward, to be very satisfactory.

Although the strict conservation of coal must be the primary consideration in a national fuel policy, freedom of choice to the consumer, both industrial and domestic, must come next. It is estimated that after the war it will be necessary to build between three and four million new houses. Whether under direct Government schemes or by local authorities, the vast majority of these houses will be built by the use of public money, and both gas and electricity undertakings, which, incidentally, are very large payers of rates and taxes, should be given equal opportunities to supply the needs of the residents in those new houses.

Some local authorities owning electricity undertakings have deliberately excluded gas from their housing estates, and this makes me feel most strongly that the Government ought to introduce a short Bill making it compulsory on all authorities erecting houses with public money to provide both gas and electricity services, leaving it to the consumer to decide which he will use for lighting, heating, cooking, &c.

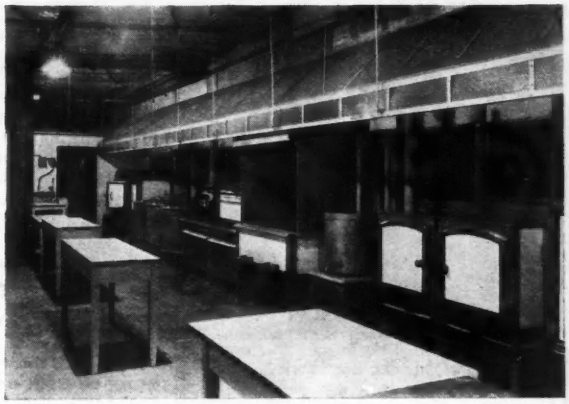
During the past 12 months various committees of the Gas Industry have been very actively considering post-war development, and a comprehensive report is to be submitted to the Minister of Fuel. There are at present more than 1,000 separate undertakings, and it is generally accepted that the Industry must find some way of reducing this number, and organizing the supply of gas over wider areas, in order to obtain the greatest possible efficiency, to bring about more uniformity in price and service to the consumer, and to make gas available as widely as possible. The two methods which have been adopted in the past for achieving these objects have been amalgamation and the grouping of undertakings under the control of holding companies.

The South-Eastern Gas Corporation was the first of the holding companies, and it has always been the policy of your Directors to bring under one control and management gas undertakings forming a complete geographical group, as only in this way can the fullest advantages be obtained. For instance, taking most of Kent and East Sussex, there are 37 undertakings supplying gas over an area of about 1,750 square miles; 21 of these undertakings, supplying two-thirds of the total gas sold in the area, have already come under the control of the Corporation, and a substantial degree of co-operation and joint working has been established. The holding company provides a very simple method of grouping undertakings, and where it is desirable to carry out further integration by amalgamation, the fact that the undertakings are already under one control makes it very much easier.

In order that the best interests of the Industry and of the consumer may be served, it is very necessary to have full co-operation between the various holding companies, and to this end we have formed an association called the Association of Gas Corporations, of which I am the President. Holding companies can undoubtedly play a very important part in the post-war reorganization of the Gas Industry, and the Association is now preparing a report showing what has already been achieved, and what can be done after the war to improve the efficiency and service of the Industry by this means.

Gas Equipped Catering Centre

One of the country's most efficient Catering Centres was recently opened at Nottingham, at which the record number of 2,760 meals served in a period of 2½ hours has already been achieved. The whole of the gas cooking equipment was supplied by Radiation Ltd., to the



order of the Nottingham Corporation Gas Department. The apparatus is finished in "Radar" porcelain enamel and chromium plate, and the installation does credit to the Gas Department and to the Industry. Although a profit was not looked for in this venture, we understand that the popularity of this "Quick Service Restaurant" is already resulting in a substantial balance on the right side.

Thomas Broadbent & Sons, Ltd., of Huddersfield, advise us that their telephone number has now been changed to Huddersfield 5520 (6 lines).

The Berger Group of companies has enlarged its wide interests by the inclusion of Berger Plastics Developments, Ltd. The Directors are W. J. Darby, L. E. Wakeford, F. Macmanners, and C. G. Fry.

George Wilson Gas Meters Ltd., Coventry, are closing their works for the annual holiday for the week July 10 to 17. A skeleton staff at the offices will deal with urgent enquiries.

The fact that goods made of raw materials in short supply owing to war conditions are advertised in the "Journal" should not be taken as an indication that they are necessarily available for export.

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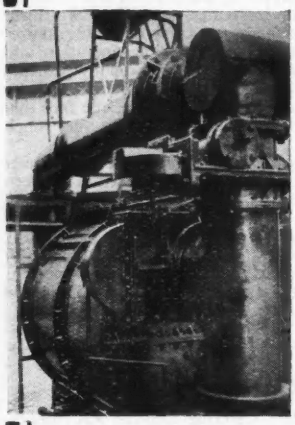

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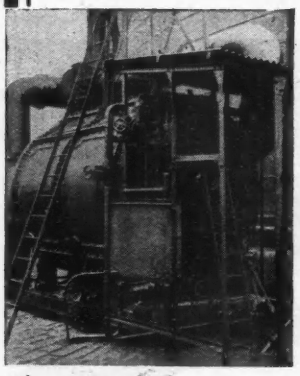

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Products Prices—Stocks and Shares

The London Market June 28.

All Coal Tar Products are in good demand, and Pitch in the London area remains about 45s.

Attention is called to a new Government Order which has just been issued, the Control of Coal Tar Naphtha and Xylole Order, 1943 (S. R. & O. 1943, No. 768).

This new Order differs from the old 1942 Order mainly in the fact that it embraces the supply of these commodities in very small quantities.

Apart from this there is nothing of interest to report.

The Provinces June 28.

The average prices of gas-works products during the week were: Pitch and Crude Tar,* Toluole, naked, North, 90's, 1s. 10d., pure, 2s. 5d. (controlled by the Control of Toluene No. 2 Order, July 3, 1941, which fixes the maximum price at which this material may be sold). Naphtha and Xylole controlled by the Coal Tar Naphtha and Xylole Order, 1943, dated May 31 (S. R. & O., 1943, No. 768), operative from June 1. Carbolic acid, 60's, naphthalene, and anthracene controlled by the Coal Tar Products Prices Order S. R. & O. 2509, dated Dec. 7, 1942, and operative from Jan. 1, 1943. Filtered heavy oil (min. gr. 1,080), 7½d. to 8d. Creosote oil has been generally controlled as to direction and price for some time past. Current value—fuel grades 5d. to 5½d.; timber preservation and other purposes 4¾d. to 6d.

* In regard to pitch and crude tar prices we would ask readers to refer to the editorial note on p. 396 of the "JOURNAL" for Sept. 10, 1941.

Tar Products in Scotland June 26.

Business in spot lots has been more plentiful during the week.

Refined tar controlled. Value is 4½d. per gallon *ex* Works, naked. Creosote oil: Specification oil, 6½d. to 7d.; low gravity, 7½d. to 7¾d.; neutral oil, 6d. to 6½d.; hydrogenation oil, 5⅞d. per gallon; all *ex* Works in bulk. Refined cresylic acid is quite active at 3s. 6d. to 4s. 6d. per gallon, *ex* Works, naked, according to quality. Crude naphtha: 6½d. to 7d. per gallon. Solvent naphtha: Basic prices delivered in bulk, 90/180 grade 2s. 8d., and 90/190 Heavy naphtha, Unrectified, 1s. 10½d.; Rectified, 2s. 3d. per gallon. Pyridine: 90/160 grade, 13s., and 90/140 grade, 15s. per gallon.

The tone of the Stock Market was firmer last week, with British funds showing a hardening tendency.

There was no marked increase in the volume of business in the Gas section, though it is apparent that any stock coming into the market is speedily taken up. Especially was this the case last week with regard to "ordinaries," of which the amounts available are very limited, and prices responded accordingly. A feature was the sharp rise of 8 points in Cardiff stock, which changed hands at 112 against the previous best in February last at 105. Business was done in Barnet ordinary at 158½, and the quotation closed 3 points higher at 157½. There was also a good demand for Imperial Continental, which closed higher.

The following changes in price were recorded during the week:

OFFICIAL LIST		
Barnet Ord.	155—160	+3
British Ord.	107—112	+2
Cardiff Ord.	110—115	+8
Croydon Sliding Scale	122—127	+1
Ditto max. Div.	101—106	+1
Gas Light 3 p.c. Deb.	84—87	−1
Ditto 5 p.c. Red. Deb.	107—110	+1
Imperial Continental	86—89	+2
South Metropolitan Ord.	82—85	+½
United Kingdom Gas Corporation Ord.	19/9—20/9	+-/3d.
Wandsworth Ord.	107—112	+3
Watford Ord.	109—114	+1

SUPPLEMENTARY LIST		
Guildford 4½ p.c. Red. Deb. (x.d.)	100—105	June 21
Newport (Mon.) 5 p.c. Deb. (x.d.)	110—115	"
Reading 4 p.c. Deb. (x.d.)	97—102	"
York 5 p.c. Red. Deb. (x.d.)	98—103	"

PROVINCIAL EXCHANGES		
Bristol 1st 4 p.c. Deb. x.d.)	100½—102½	June 15
Ditto 2nd 4 p.c. Deb. (x.d.)	100½—102½	"
Ditto 5 p.c. Deb. (x.d.)	115—119	"
Chester 4 p.c. Pref. (Cum.) (x.d.)	78—80	"
Ditto 4 p.c. Pref. (Non-Cum.) (x.d.)	78—80	"
Ditto 3½ p.c. Deb. (x.d.)	77—81	"
Ditto 4 p.c. Red. Deb. (x.d.)	97—99	"

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